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European Patent Office

11 Publication No. 0 369 039  
A 1

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EUROPEAN PATENT APPLICATION

21 Application no. 88118559.9

51 Int. CL. no. B01D 35/2. B01D 29/13

22 Application date: 08.11.88

43 Publication date of application:  
23.05.90 Patent Office Journal 90-21

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84 Nominated contracting states:  
AT BE CH DE ES FR GB IT LI NL SE

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54 Filter for liquid fuels

57 A filter for liquid fuels is inserted into the interior of a fuel tank through a narrow circular opening and consists of a filter gauze (7) closed on all sides, with a flexible support frame (1) inside it, joined to a pump connection stub (13) which protrudes from the filter gauze (7).

It is proposed that to bend, fold or twist the filter so that it can be installed, the support frame (1) should consist of an open, oblong or oval interior space (6), whereby only its attachment point (10) to the connection hub (9) exhibits rigid stability, and that apart from the support frame (1), which together with the connection hub (9) constitutes a component which can be manufactured as an injection moulding in one piece, the only other component is a pump connection stub (13) which clamps the filter gauze (7) to the connection hub (9).

### Filter for liquid fuels

The invention concerns a filter for liquid fuels, which can be inserted through a narrow circular opening into the interior of a fuel tank, and which consists of a flexible support frame made of a thermoplastic material supporting the inside of a filter gauze closed on all sides, with a pump connection stub connected to the flexible frame and protruding from the filter gauze.

A filter of this kind is known from DE-A1-38 09 906. The known filter is based on the recognition that filters of this kind require changes in shape in order for the preassembled filter to be inserted through the circular opening, the diameter of which is usually only 40-60 mm. Since this procedure involves assembly time and demands manual dexterity, adequate characteristics regarding changes of shape, together with a favourable shape and appropriate dimensions, are known to be required.

However, it has been shown that the known measures for achieving adequate temporary changes in shape are insufficient and that above all, the dimensions at the pump connection stub are still relatively large as regards height and therefore unfavourable, and that the necessary individual parts cannot be mounted in an optimum way.

The underlying objective of the present invention is therefore to increase further the flexibility of the support frame and improve the overall dimensions of the filter (as regards height) for easier assembly on the one hand and easier installation in the fuel tank on the other hand.

The task is solved in the invention by means of a flexible support frame which can be twisted and/or folded over, and which constitutes an open oblong or oval interior space in which only the attachment point to the connection hub exhibits rigid stability, and that apart from the support frame, which together with the connection hub constitutes a component which can be manufactured by injection moulding in one piece, the only other component is the pump connection stub clamping the filter gauze to the connection hub. This solution provides substantially greater flexibility and freedom to change the shape, as the filter can be twisted, folded over or bent before insertion in the fuel tank more easily than was previously the case. Furthermore, the installed height is less, because the known clamping sleeve has been dispensed with, or rather its function has been assumed by the pump connection stub, so that apart from the filter gauze only two components are necessary.

A further suggestion is that the central internal bore of the connection hub should have a female taper pointing downwards, followed directly by a wider bore so that a shoulder is formed, and that the pump connection stub should have the same male taper on a the outer wall of a cylindrical bore which is inserted into the connection hub, with a matching flange-shaped lip which in the assembled condition engages in the wider bore behind the inlet taper. The pump connection stub therefore assumes the function of the previously-known clamping sleeve, so that only two injection moulded parts are required.

A further improvement of the invention lies in the fact that until shortly before being inserted into the interior of the fuel tank, the pump connection stub is closed off by a cap which can be pushed on and taken off. The cap prevents the ingress of dirt particles during transport of the filter up to final installation in the fuel tank.

The drawings show sketches of embodiments of the invention and are explained in greater detail below. These are:

Fig. 1: A side elevation of the support frame without any other filter parts.

Fig. 2: A plan view of the support frame in Fig. 1.

Fig. 3: A plan view of the complete filter assembly with an alternative support frame.

Fig. 4: A partial section on A-B in accordance with the details in Figs. 2 and 3.

Fig. 5: A longitudinal section of the complete filter assembly, consisting of the support frame with the connection hub, the pump connection stub, the cap and the filter gauze.

In accordance with Fig. 1, a filter for liquid fuel, such as e.g. petrol, which is pushed through a circular opening of approximately 40 to 60 mm diameter into the interior space of a vehicle fuel tank, has a flexible support frame (1), manufactured from a thermoplastic. The support frame 1 is made up of relatively thin rod sections 2, 3, and 4, bearing spacers 5 and which bound an open interior space 6. The open interior space 6 can be oblong or oval, or as in shown in Figs. 2 and 3, rectangular. The filter gauze 7 is cut to fit such a basic shape and welded to the three sides so produced at a fold edge 8.

The flexibility, bendability, twistability and foldability of the filter are determined by the basic shape of the support frame 1. The thin rods 2 to 4 are manufactured as one moulding and are then joined rigidly to the connection hub 9, thereby producing the rigid attachment point 10 because the rods 2 to 4 and the connection hub 9 are manufactured as a single injection moulding. The rigid attachment point 10 is represented in an alternative embodiment (Fig. 3) by a rib 12.

As shown in Fig. 4, the filter assembly consists only of the support frame 1 with the connection hub 9, the filter gauze 7 and a pump connection stub 13 which clamps on the filter gauze 7.

The connection hub 9 forms seating surfaces 14a to 14d which are particularly favourable for assembly purposes (Fig. 2). The connection hub 9 has a downwards-pointing (Fig. 4) female taper 16 within its central internal bore 15, followed directly by a wider bore 18, so resulting in a shoulder 17. The pump connection stub 13 has a matching male taper 20 on a shaft 19 insertable into connection hub 9 and a cylindrical section 21 which engages behind the inlet taper 16 when assembled and fits in the wider bore 18. After the support frame 1 has been placed inside the filter gauze 7, the pump connection stub 13 is pressed into the connection hub 9 and the filter gauze 7 is then welded.

After welding, the pump connection stub 13 is kept closed off until shortly before the filter is inserted into the interior of the fuel tank by means of a cap 22 (also made of plastic) which can be pushed on and taken off.

It is possible to remove the pump connection stub 13 by means of an opening 23 produced in the underside of injection moulding 11 when the latter is manufactured, and the provision of separate feet 24a, 24b, 24c and 24d: a certain amount of force is required here to spread the feet 24a to 24d apart.

### Claims

1. Filter for liquid fuels, capable of insertion into the interior of a fuel tank through a narrow circular opening, and consisting of an internal flexible support frame, made of thermoplastic, inside a filter gauze closed on all sides, with a pump connection stub attached to the support frame, out of which the closed filter gauze protrudes, characterised by the fact that

the flexible, twistable and/or bendable support frame (1) forms an open, oblong or oval interior space (6), whereby the only part exhibiting rigid stability is the attachment point (10) to a connection hub (9), and that apart from the support frame (1), which together with the connection hub (9) represents a part capable of being manufactured in one piece as an injection moulding (11), the only other part is a pump connection stub (13) which clamps the filter gauze (7) to the connection hub (9).

2. Filter as in Claim 1,

characterised by the fact that

the connection hub (9) has in its central inner bore (15) a female taper pointing axially downwards (16) and followed directly by a wider bore (18) thereby forming a shoulder (17), and the pump connection stub (13) has the same male taper (20) on a the outer wall of a cylindrical bore (19) which is inserted in the connection hub (9), and also a matching cylindrical section (21) which in the assembled condition engages in the wider bore (18) flange-shaped lip behind the female taper (16).

3. Filter as in Claims 1 and 2,

characterised by the fact that

the pump connection stub (13) is closed off until shortly before installation in the interior of the vehicle fuel tank by a cap (22) which can be pushed on and taken off.

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**FIG. 4**

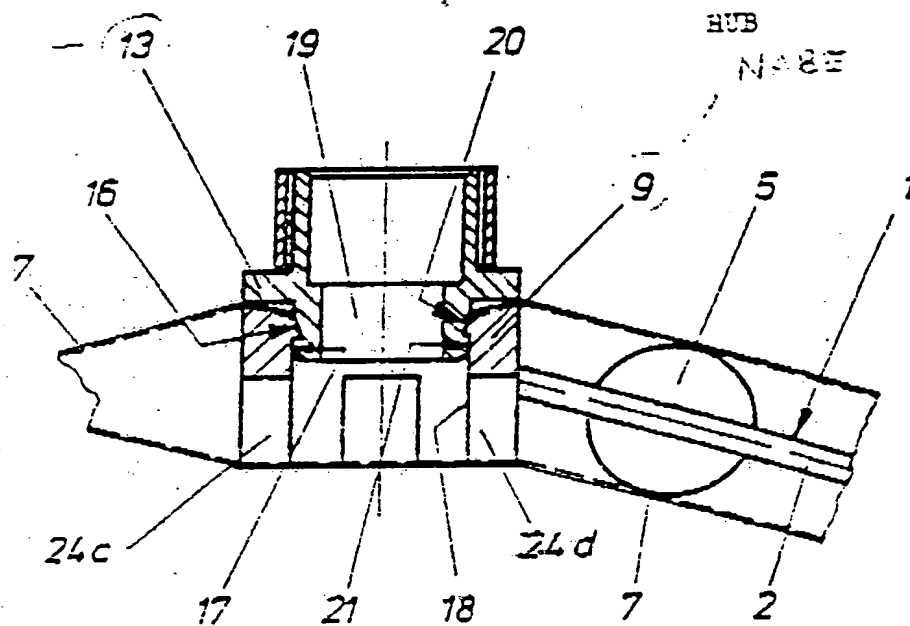
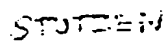
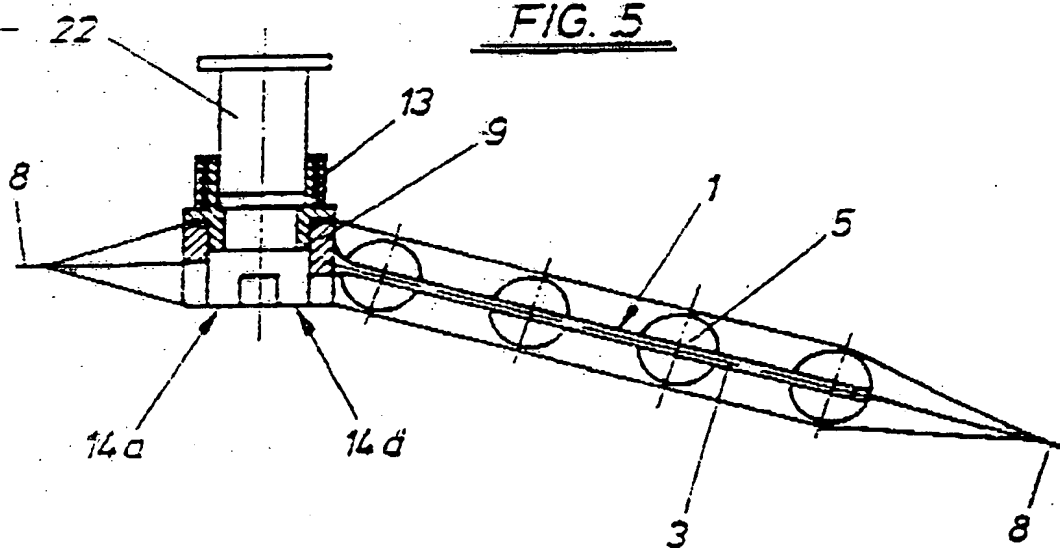
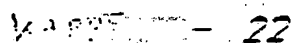


FIG. 5



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